THE DISSOCIATION OF HEXAARYLETHANES

BY
CHESTER MORA HIMEL
B.S., University of Chicago, 1938
M.S., University of Illinois, 1939

AN ABSTRACT OF A THESIS
SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF DOCTOR OF PHILOSOPHY IN
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ACKNOWLEDGMENT

The writer is deeply indebted to Professor C. S. Marvel who has consistently correlated the results of this investigation, and whose help and advice have made possible the progress obtained.

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Introduction

Since Gomberg's[1] classical work on hexaphenylethane, many theories have been advanced to explain the dissociation of hexaarylethanes. The purpose of this investigation was to measure the degree of dissociation of hexaarylethanes by the magnetic susceptibility method and to correlate the results obtained. The hexaphenylethanes which were studied carried alkyl, halogen or aryl substituents.

Discussion of Results

The following hexaarylethanes have been prepared in solution, and the degree of dissociation measured by the magnetic susceptibility method.[2, 3, 4, 5, 6, 7] The data are given for 0.1 M solutions of the ethane in benzene at 25° C; hexaphenylethane (2±1%), tetra-*p*-tolyldiphenylethane (5.5±1%, di-*m*-tolyltetraphenylethane (6.5±1%), tetra-*m*-tolyldiphenylethane (7.0±1%), di-*o*-tolyltetraphenylethane (24.0±1%), tetra-*o*-tolyldiphenylethane (82±2%), di-*o*-ethylphenyltetraphenylethane (33±2%), di-*p*-*n*-propylphenyltetraphenylethane (6.5±1%), tetra-*p*-isopropylphenyldiphenylethane (8.5±1%), hexa-*p*-*n*-butylphenylethane (18.5±2%), di-*p*-isobutylphenyltetraphenylethane (7.5±1%), di-*p*-*sec*-butylphenyltetraphenylethane (7.5±1%), tetra-*p*-*sec*-butylphenyldiphenylethane (8.5±1%), di-*p*-*tert*-butylphenyltetraphenylethane (7.5±1%), tetra-*p*-*tert*-butylphenyldiphenylethane (8.5±1%), hexa-*p*-*tert*-butylphenylethane (20±4%), di-*p*-*tert*-amylphenyltetraphenylethane (7.5±1%), tetra-*p*-*tert*-amylphenyldiphenylethane (8.5±1%), hexa-*p*-*tert*-amylphenylethane (33±3%), di-*m*-*n*-amylphenyltetraphenylethane (9.0±1%), di-*p*-tolyldi-*p*-ethylphenyldiphenylethane (6±1%), di-*p*-tolyldi-*p*-*tert*-butylphenyldiphenylethane (6.5±1%), tetra-*p*-tolyl-di-*p*-*tert*-butylphenylethane (5.0±1%), tetra-*p*-*tert*-butylphenyl-di-*p*-tolylethane (5.0±1%), di-*p*-tolyldi-*p*-ethylphenyldi-*p*-isopro-

pylphenylethane (10±2%), di-*p*-cyclohexylphenyltetraphenylethane (8.5±1%), tetra-*p*-cyclohexylphenyldiphenylethane (9.5±1%), hexa-*p*-cyclohexylphenylethane (20±7%), tetra-*p*-biphenyldiphenylethane (17±2%), hexa-*p*-biphenylethane (24±5%), di-β-naphthyltetraphenylethane (6±2%), tetra-β-naphthyldiphenylethane (13 ± 2%), hexa-β-naphthylethane (24±5%), di-∝-naphthyldi-*p*-biphenyldiphenylethane (54±2%), di-∝-naphthyltetraphenylethane (27±2%), di-*p*-fluorophenyltetraphenylethane (3.5±1%), di-*p*-chlorophenyltetraphenylethane (5.0±1%), di-*p*-bromophenyltetraphenylethane (5±1%), di-*p*-iodophenyltetraphenylethane (6±1%), di-*m*-chlorophenyltetraphenylethane (6.5±1%), di-*m*-bromophenyltetraphenylethane (7.0±1%), di-*o*-fluorophenyltetraphenylethane (7.5±1%), di-*o*-chlorophenyltetraphenylethane (12±1%), di-*o*-bromophenyltetraphenylethane (17±2%), tetra-*p*-bromophenyldiphenylethane (7.5±2%), 1,1,2-triphenyl-1,2,2-tri-*p*-tert-amylphenylethane (3.5±1%), 1,1-diphenyl-1,2,2,2-tetra-*p*-*tert*-butylphenylethane (3.5±1%), 1,1,2,2-tetraphenyl-1,-*o*-tolyl-2,-β-naphthylethane (26±2%), 1,2,2-triphenyl-1,1,2-tri-*o*-tolylethane (27±2%), 1,1,1-tri-*p*-biphenyl-2,2,2-tri-β-naphthylethane (25±5%).

Measurement of di-∝-naphthyltetraphenylethane, di-p-cyclohexylphenyletraphenylethane, and tetra-*p*-cyclohexylphenyldiphenylethane in solution at varying concentrations showed that the degree of dissociation followed the mass law in each case.

Several examples of a new type of "mixed ethane" have been prepared in solution. These ethanes are prepared from two unlike chloromethanes and molecular silver.

The dissociation of hexaarylethanes has been found to be dependent on weight, steric and symmetry factors in the ethane. The data indicates that the number, size, weight and position of the substituent are more important than whether the substituent is alkyl, halogen or aryl.

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VITA

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